COURSE DESCRIPTION CARD - SYLLABUS

Course name
Linear and Quadratic programming

Course

Field of study
Mathematics in Technology

Year/Semester
3/5

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	30	
Tutorials	Projects/seminars	

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

The student starting this subject should have knowledge and skills of the course Numerical Linear Algebra from previous semesters. Should know the limits of their own knowledge and understand the need for further education.

Course objective

Presentation of selected algorithms of linear and quadratic programming.

Course-related learning outcomes

Knowledge

1. has extended and in-depth general knowledge of various branches of higher mathematics, including theorems and proofs, and advanced detailed knowledge about the application of mathematical techniques, methods and tools in engineering and technical sciences

2. has extended and in-depth knowledge of mathematical modelling

3. has systematized knowledge of terminology in mathematics and selected issues in the field of engineering and technical sciences related to the field of study, also in a foreign language

4. has deepened and theoretically founded knowledge of computer science, including numerical methods; knows at least one software package or a programming language in detail

Skills

1. can use knowledge of higher mathematics;

2. can build and analyse simple mathematical models;

3. is able to construct an algorithm for solving a simple engineering task as well as implement and test it in a selected programming environment;

4. is able to use equipment and tools, in accordance with general requirements and technical documentation; knows how to apply the principles of health and safety at work;

5. knows how to use a foreign language sufficiently to communicate, as well as read and understand mathematical texts, technical documentation and similar documents;

6. is able to plan and implement self-education independently in order to raise and update their competences.

Social competences

1. is aware of the deepening and expanding knowledge to solve new technical problems;

2. is able to work as a team; understands the need for systematic work on any projects that have a long-term nature.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified by a 45-minute colloquium consisting of variously scored questions (test and open). Passing threshold: 50% of points. Final issues on the basis of which questions are prepared will be forwarded to students during the lecture preceding the colloquium, or sent by e-mail using the university's e-mail system.

Skills acquired as part of the laboratory are verified on the basis of developed projects and final test. Passing threshold: 50% of points.

Programme content

Polyhedrons, vertices and edges

Geometric simplex method

Simplex tableau

Two-phase simplex method

Properties of the simplex method

The theory of duality

Dual method simplex

Discrete optimization

Division and restrictions method

Graphs

Flows in networks

Transportation problem

Quadratic programming - optimality conditions and computational methods.

Teaching methods

1) lectures:

- lecture with presentation supplemented with examples given on the board,

- a lecture conducted in an interactive manner with formulating questions to a group of students or to specific students indicated,

- students' activity during classes is taken into account when issuing the final mark,

- during the lecture initiating the discussion,

- theory presented in close connection with practice,

- theory presented in connection with the current knowledge of students,

- presenting a new topic preceded by a reminder of related content known to students in other subjects.

2) laboratory:

- laboratories supplemented with multimedia presentations (including: drawings, photos, animations, sound, films),

- detailed reviewing of reports by the laboratory chair and discussions on comments,

- using tools that enable students to perform tasks at home (eg open source software),

- demonstrations,

- work in teams,

- computational experiments.

Bibliography

Basic

1. Horla D., Metody obliczeniowe optymalizacji w zadaniach, WPP, Poznań, 2016

2. Jędrzejczyk Z., Kukuła K., Skrzypek J., Walkosz A., Badania operacyjne w przykładach i zadaniach, PWN, Warszawa, 2016

Additional

1. Kincaid D., Cheney W., Analiza numeryczna [Numerical Analysis: Mathematics of Scientific Computing (The Sally Series; Pure and Applied Undergraduate Texts, Vol. 2)], WNT, Warszawa 2006.

2. Cormen T. H., Leiserson C. E., Rivest R. L., Stein C., Wprowadzenie do algorytmów [Introduction to Algorithms], PWN, Warszawa, 2018

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	55	2,0

[1] delete or add other activities as appropriate